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EXAMINER	
HO, ALLEN C	

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 10/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/788,335	JAFFRAY ET AL.	
	Examiner	Art Unit	
	Allen C. Ho	2882	

-- The MAILING DATE of this communication appears on th cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 August 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23,26-62 and 64-102* is/are pending in the application.

4a) Of the above claim(s) *36-62 and 81-93* is/are withdrawn from consideration.

5)☒ Claim(s) *78-80* is/are allowed.

6)☒ Claim(s) *1-23,26-35,64-77 and 95-102* is/are rejected.

7)☒ Claim(s) *94* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☒ The proposed drawing correction filed on *13 August 2003* is: a)☐ approved b)☒ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Drawings

1. The drawings submitted on 13 August 2003 appear to be informal drawings, different from the drawings submitted on 15 March 2002. The applicant is invited to resubmit changes with formal drawings.

Claim Objections

2. Claim 3 is objected to because of the following informalities: Claim 3 should depend on claim 2. Claim 3 recites the limitation "said kV x-ray source". There is insufficient antecedent basis for this limitation in the claim. Appropriate correction is required.

3. Claim 4 is objected to because of the following informalities: line 1, "x-ray" should be replaced by --radiation--. Fig. 17(a) shows a linear accelerator (**409**) and an x-ray source (**402**). Thus, it is the radiation source that comprises a linear accelerator. Appropriate correction is required.

4. Claims 5, 7, and 9 are objected to because of the following informalities: line 1, --further comprising-- should be inserted before "a stage". Appropriate correction is required.

5. Claims 69 and 96 are objected to because of the following informalities: line 4, --from an x-ray source-- should be inserted after "form" to avoid confusion with the radiation source. Appropriate correction is required.

6. Claims 74 and 75 are objected to because of the following informalities: line 1, "63" should be stricken through. Appropriate correction is required.

7. Applicants filed a preliminary amendment on 09 September 2002 adding claim 94, however, a new claim 94 was added with applicants' response on 13 August 2003. In this office action, the examiner only acted on the recently added claim 94.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

9. Claims 6, 8, 10, 12, 13, 23, 26, 27, 65, 70, 77, and 95 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 6, 8, 10, 12, 13, 65, 70, 77, and 95 claim a radiation therapy system comprising: a radiation source, a cone-beam CT system, and a rotating stage. Figs. 17(a) and 17 (b) show a radiation source and a cone-beam CT system, but they fail to teach a rotating stage. Fig. 4 shows a cone-beam CT system and a rotating stage, but it fails to teach a radiation source.

Claim 23 claims a radiation therapy system comprising a gantry with two arms, and the gantry rotates about two axes. Although the embodiment shown in Fig. 22 has two axes of rotation, it has only one arm (C-arm) and it does not have a radiation source. Claims 26 and 27 claim a radiation therapy system comprising a mobile gantry with two arms, again Fig. 22 fails to show a gantry having two arms and a radiation source.

10. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

11. Claims 71, 72, 97, and 98 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 71, 72, 97, and 98 claim emitting a second set of x-rays. It is unclear whether this second set of x-rays are emitted from the radiation source or the x-ray source.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. Claims 1, 4, 5, 9, 11, 14-20, 28, 30, 31, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S Patent No. 5,661,773) in view of Hu (U. S. Patent No. 5,663,995) and Roos *et al.* (U. S. Patent No. 6,041,097).

With regard to claim 1, Swerdloff *et al.* disclosed a radiation therapy system comprising: a radiation source (**12**) that moves about a path and directs a beam of radiation towards an object (**17**); a fan-beam computer tomography system comprising: an x-ray source (**46**) that emits an x-ray beam towards the object, and an imager (**50**) receiving x-rays after they pass through the object, the imager providing an image of the object; and a computer (**51**) connected to the radiation source and the computer tomography system, wherein the computer receives the

image of the object (column 6, lines 53-61) and based on the image (column 14, lines 9-13) sends a signal to the radiation source that controls (**48**, **52**, **54**) the path of the radiation source (column 7, lines 5-8).

However, Swerdloff *et al.* failed to teach or fairly suggest that the computer tomography system comprising a cone-beam x-ray source and an amorphous silicon flat-panel imager.

Hu taught that helical scan could be performed to reduce the total scan time required for multi-slice imaging (column 1, lines 48-59). Furthermore, Hu taught that cone-beam helical scanning provides improved slice profiles, greater partial volume artifact reduction, and faster patient exam speed as compared to fan-beam helical scanning (column 2, lines 3).

Roos disclosed a cone-beam CT system comprising a cone-beam x-ray source (**18**) and an amorphous silicon flat panel imager (**20**). Roos taught that the amorphous silicon flat panel imager has higher spatial resolution than conventional CT detectors (column 5, lines 16-33).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace slice CT imaging disclosed by Swerdloff *et al.* with a cone-beam computer tomography system, since a person would be motivated to gain the advantages offered by a cone-beam CT system.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ an amorphous silicon flat panel imager, since a person would be motivated to use an imager that has higher spatial resolution, permitting detailed examination of a region of interest.

With regard to claim 4, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the radiation therapy system of claim 1, wherein the radiation source comprises a linear accelerator (column 1, lines 36-39).

With regard to claim 5, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the radiation therapy system of claim 1, comprising a stage (bed) that moves the object relative to the x-ray source and the amorphous silicon flat-panel imager (inherent in a CT).

With regard to claim 9, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the radiation therapy system of claim 4, comprising a stage (bed) that moves the object relative to the x-ray source and the amorphous silicon flat-panel imager (inherent in a CT).

With regard to claim 11, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the radiation therapy system of claim 1, comprising an x-ray source, wherein the x-rays from the x-ray source are emitted along a source plane.

With regard to claims 14-17, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the radiation therapy system of claim 1, comprising an amorphous silicon flat-panel imager (**70**) that comprises a two-dimensional array of individual detector elements (**74**), wherein each of the individual detector elements comprises a-Si:H photodiode coupled to a transistor (column 3, lines 48-50).

With regard to claims 18-20, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the radiation therapy system of claim 1, wherein the computer receives a two-dimensional projection image from the amorphous silicon flat-panel imager and generates a computer tomography of the object based on the two-dimensional projection image (inherent for a CT).

With regard to claim 28, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the radiation therapy system of claim 1, wherein the radiation source operates at a power level higher than that of the x-ray source, wherein the radiation is of an intensity and energy that is effective for radiation treatment of an area of the object (inherent).

With regard to claim 30, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the radiation therapy system of claim 1, wherein the x-ray source rotates about an axis that is coincident with an axis of rotation of the radiation source (mounted on the same gantry).

With regard to claim 31, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the radiation therapy system of claim 1, wherein the x-ray source is displaced (circumferentially along the gantry) relative to the radiation source.

With regard to claim 35, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the radiation therapy system of claim 1, further comprising an imaging device (**50'**) positioned opposite the radiation source and generating an image of the object based on the radiation from the radiation source that passes through the object.

14. Claims 2, 3, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S Patent No. 5,661,773) in view of Hu (U. S. Patent No. 5,663,995) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claim 1 above, and further in view of Cullity (1978).

With regard to claims 2 and 3, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the radiation therapy system of claim 1, comprising an x-ray source (**46**).

However, these references fail to teach or fairly suggest that the x-ray source is a KV x-ray source, and it emits x-rays with energies of approximately 100 KeV.

Cullity taught that in order to produce x-rays, electrons are accelerated to energy in the KeV range (*bremsstrahlung* radiations).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to accelerate electrons in the energy range of KeV, since a person would be motivated to produce x-rays. Furthermore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide an x-ray source that emits x-rays with energies of approximately 100 KeV, since a person would be motivated to produce x-rays in a suitable energy range based on the mass density of the object.

With regard to claim 7, Swerdloff *et al.* in combination with Hu, Roos *et al.*, and Cullity disclosed the radiation therapy system of claim 2, comprising a stage (bed) that moves the object relative to the x-ray source and the amorphous silicon flat-panel imager (inherent in a CT).

15. Claims 6, 8, 10, 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S Patent No. 5,661,773) in view of Hu (U. S. Patent No. 5,663,995) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claims 5, 7, and 9 above, and further in view of Dobbs (U. S. Patent No. 6,148,058).

With regard to claims 6, 8, and 10, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the radiation therapy system of claims 5, 7, and 9, comprising a stage (bed) that moves the object relative to the x-ray source and the amorphous silicon flat-panel imager (inherent in a CT).

However, these references fail to teach or fairly suggest that the stage rotates about an axis of rotation the object relative to the x-ray source and the amorphous silicon flat-panel imager.

Dobbs *et al.* disclosed a CT scanner that comprises a stage (**22**) rotating about an axis of rotation (**28**) relative to an x-ray source (**12**) and an imager (**14**).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ a stage that rotates about an axis of rotation relative to the x-ray source and the amorphous silicon flat-panel imager, since there are occasions a patient must be imaged in an up-right position.

With regard to claim 12, Swerdloff *et al.* in combination with Hu, Roos *et al.*, and Dobbs disclosed the radiation therapy system of claim 6, wherein the x-rays from the x-ray source are emitted along a source plane that is perpendicular to the axis of rotation.

16. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S Patent No. 5,661,773) in view of Hu (U. S. Patent No. 5,663,995), Roos *et al.* (U. S. Patent No. 6,041,097), and Dobbs (U. S. Patent No. 6,148,058) as applied to claim 10 above, and further in view of Röckseisen (U. S. Patent No. 5,675,625).

With regard to claim 13, Swerdloff *et al.* in combination with Hu, Roos *et al.*, and Dobbs disclosed the radiation therapy system of claim 10.

However, these references fail to teach or fairly suggest that the radiation therapy system further comprises an alignment laser that allows visualization of the axis of rotation and the source plane.

Röckseisen disclosed an alignment laser that allows visualization of the axis of rotation .

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ an alignment laser that allows visualization of the axis of rotation

and a source plane, since a person would be motivated to align the x-ray beam with the isocenter of the object.

17. Claims 21, 22, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S Patent No. 5,661,773) in view of Hu (U. S. Patent No. 5,663,995) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claim 1 above, and further in view of Suzuki *et al.* (U. S. Patent No. 6,318,892 B1).

With regard to claim 21, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the radiation therapy system of claim 1, comprising a gantry (**44**), an x-ray source, and an amorphous silicon flat-panel imager.

However, these references fail to teach or fairly suggest that the radiation therapy system further comprises a first arm and a second arm, wherein the x-ray source is attached to the first arm and the amorphous silicon flat-panel imager is attached to the second arm.

Suzuki *et al.* disclosed a CT system that comprises a gantry (**102**) with a first arm (**103**) and a second arm (**104**), an x-ray source (**105**), and an imager (**106**), wherein the x-ray source is attached to the first arm and the imager is attached to the second arm. Suzuki *et al.* taught that such a configuration permits a physician easy access to a patient during interventional radiology.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to attach the x-ray source and the amorphous flat-panel imager to arms external to the gantry, since a person would be motivated to mount the x-ray source and the amorphous flat-panel imager in such a manner to provide a physician easy access to a patient during interventional radiology (IVR).

With regard to claim 22, Swerdloff *et al.* in combination with Hu, Roos *et al.*, and Suzuki *et al.* disclosed the radiation therapy system of claim 21, wherein the gantry rotates about an axis of rotation.

With regard to claim 29, Swerdloff *et al.* in combination with Hu, Roos *et al.*, and Suzuki *et al.* disclosed the radiation therapy system of claim 21, wherein the radiation source operates at a power level higher than that of the x-ray source, wherein the radiation is of an intensity and energy that is effective for radiation treatment of an area of the object (inherent).

18. Claims 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S Patent No. 5,661,773) in view of Hu (U. S. Patent No. 5,663,995) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claim 1 above, and further in view of Richey *et al.* (U. S. Patent No. 4,547,892).

With regard to claims 32-34, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the radiation therapy system of claim 1.

However, these references fail to teach or fairly suggest operating the cone-beam computer tomography system with an external trigger that controls a biological process of a patient.

Richey *et al.* taught using cardiac (ECG) and breathing motion (pulmonary) signals as external triggers in CT imaging (column 5, lines 56-61). Furthermore, Richey *et al.* taught that involuntary muscular activity makes accurate image reconstruction of other parts of the body difficult (column 1, lines 16-18).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use cardiac (ECG) and breathing motion (pulmonary) signals as external

triggers in CT imaging (column 5, lines 56-61), since a person would be motivated to minimize any motion or activity in the object being imaged, which would make accurate image reconstruction difficult.

19. Claim 66-69 and 73-76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) in view of Hu (U. S. Patent No. 5,663,995) and Roos *et al.* (U. S. Patent No. 6,041,097).

With regard to claim 69, Swerdloff *et al.* disclosed a method of treating an object with radiation, comprising: moving a radiation source (**12**) about a path; directing (**51**) a beam of radiation (**14**) from the radiation source towards the object; emitting (**46**) an x-ray beam from an x-ray source towards an object (**17**); detecting (**50**) x-rays that pass through the object due to the emitting an x-ray beam with an imager; generating (**60**) an image of the object from the detected x-rays, wherein the generating comprises forming a computer tomography image of the object based on the detected x-rays; and controlling (**51**, **48**, **52**, **54**) the path of the radiation source based on the image (column 14, lines 9-13).

However, Swerdloff *et al.* did not teach emitting an x-ray beam in a cone beam form and detecting x-rays that pass through the object due to the emitting an x-ray beam with an amorphous silicon flat-panel imager.

Hu taught that helical scan could be performed to reduce the total scan time required for multi-slice imaging (column 1, lines 48-59). Furthermore, Hu taught that cone-beam helical scanning provides improved slice profiles, greater partial volume artifact reduction, and faster patient exam speed as compared to fan-beam helical scanning (column 2, lines 3).

Roos disclosed a cone-beam CT system comprising a cone-beam x-ray source (**18**) and an amorphous silicon flat panel imager (**20**). Roos taught that the amorphous silicon flat panel imager has higher spatial resolution than conventional CT detectors (column 5, lines 16-33).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace slice CT imaging disclosed by Swerdloff *et al.* with a cone-beam computer tomography system, since a person would be motivated to gain the advantages offered by a cone-beam CT system.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ an amorphous silicon flat panel imager, since a person would be motivated to use an imager that has higher spatial resolution, permitting detailed examination of a region of interest.

With regard to claims 66-68, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the method of claim 69, comprising an amorphous silicon flat-panel imager (**70**) that comprises a two-dimensional array of individual detector elements (**74**), wherein each of the individual detector elements comprises a-Si:H photodiode coupled to a transistor (column 3, lines 48-50).

With regard to claim 73, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the method of claim 69, further comprising correcting for offset and gain prior to the generating (Roos *et al.*, column 6, lines 54-58).

With regard to claims 74-76, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the method of claim 69, wherein the object comprises an animal (patient), and wherein the image delineates soft tissue (**122**) within the animal. The soft tissue selected could be from

the group consisting of fat, a muscle, a kidney, a stomach, a bowel, and a liver (inherent in a CT scan).

20. Claim 64 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S Patent No. 5,661,773) in view of Hu (U. S. Patent No. 5,663,995) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claim 69 above, and further in view of Cullity (1978).

With regard to claim 64, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the method of claim 69.

However, these references fail to teach or fairly suggest that the x-rays within the x-ray beam have an energy of approximately 100 kV.

Cullity taught that in order to produce x-rays, electrons are accelerated to energy in the KeV range (*bremsstrahlung* radiations).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide an x-ray source that emits x-rays with energies of approximately 100 KeV, since a person would be motivated to produce x-rays in a suitable energy range based on the mass density of the object.

21. Claims 65, 77, and 95 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S Patent No. 5,661,773) in view of Hu (U. S. Patent No. 5,663,995) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claim 69 above, and further in view of Dobbs (U. S. Patent No. 6,148,058).

With regard to claims 65, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the method of claim 69.

However, these references fail to teach or fairly suggest that the method further comprises the step of rotating about an axis of rotation the object relative to the x-ray source and the amorphous silicon flat-panel imager.

Dobbs *et al.* disclosed a CT scanner that comprises a stage (**22**) rotating about an axis of rotation (**28**) relative to an x-ray source (**12**) and an imager (**14**).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ a stage that rotates about an axis of rotation relative to the x-ray source and the amorphous silicon flat-panel imager, since there are occasions a patient must be imaged in an up-right position.

With regard to claim 77, Swerdloff *et al.* in combination with Hu, Roos *et al.*, and Dobbs disclosed the method of claim 65, wherein the image is formed after one rotation of the body relative to the x-ray source and the amorphous flat-panel imager (that is just a 360° scan).

With regard to claim 95, Swerdloff *et al.* in combination with Hu, Roos *et al.*, and Dobbs disclosed the method of claim 65, wherein combined motion of the cone-beam and the object achieves motion of the cone-beam upon a sphere (inherent).

22. Claim 96, 99 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) in view of Hu (U. S. Patent No. 5,663,995) and Roos *et al.* (U. S. Patent No. 6,041,097).

With regard to claim 96, Swerdloff *et al.* disclosed a method of treating an object with radiation, comprising: moving (**54**) a radiation source (**12**) about a path; directing (**51**) a beam of radiation (**14**) from the radiation source towards the object; emitting (**46**) an x-ray beam from an x-ray source towards an object (**17**); detecting (**50**) x-rays that pass through the object due to the

emitting an x-ray beam with an imager; generating (**60**) an image of the object from the detected x-rays, wherein the generating comprises forming a computer tomography image of the object based on the detected x-rays; and controlling (**51**) a radiation treatment plan (column 7, lines 59-67)) involving the radiation source based on the image (column 14, lines 9-13).

However, Swerdloff *et al.* did not teach emitting an x-ray beam in a cone beam form and detecting x-rays that pass through the object due to the emitting an x-ray beam with an amorphous silicon flat-panel imager.

Hu taught that helical scan could be performed to reduce the total scan time required for multi-slice imaging (column 1, lines 48-59). Furthermore, Hu taught that cone-beam helical scanning provides improved slice profiles, greater partial volume artifact reduction, and faster patient exam speed as compared to fan-beam helical scanning (column 2, lines 3).

Roos disclosed a cone-beam CT system comprising a cone-beam x-ray source (**18**) and an amorphous silicon flat panel imager (**20**). Roos taught that the amorphous silicon flat panel imager has higher spatial resolution than conventional CT detectors (column 5, lines 16-33).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace slice CT imaging disclosed by Swerdloff *et al.* with a cone-beam computer tomography system, since a person would be motivated to gain the advantages offered by a cone-beam CT system.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to employ an amorphous silicon flat panel imager, since a person would be motivated to use an imager that has higher spatial resolution, permitting detailed examination of a region of interest.

With regard to claim 99, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the method of claim 96, further comprising correcting for offset and gain prior to the generating (Roos *et al.*, column 6, lines 54-58).

With regard to claims 100-102, Swerdloff *et al.* in combination with Hu and Roos *et al.* disclosed the method of claim 96, wherein the object comprises an animal (patient), and wherein the image delineates soft tissue (**122**) within the animal. The soft tissue selected could be from the group consisting of fat, a muscle, a kidney, a stomach, a bowel, and a liver (inherent in a CT scan).

Allowable Subject Matter

23. Claim 94 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

24. The following is a statement of reasons for the indication of allowable subject matter:

With regard to claim 94, the prior art discloses the radiation therapy system of claim 5. However, the prior art fails to teach or fairly suggest that the combined motion of the cone-beam computer tomography system and the object moved by the stage achieves motion of the x-ray source upon a sphere, as claimed in claim 94.

25. Claims 78-80 are allowed.

26. The following is a statement of reasons for the indication of allowable subject matter:

With respect to claims 78 and 79, the prior art discloses a method of treating an object, comprising: moving a radiation source about a path; directing a beam of radiation from the

radiation source towards an object; emitting an x-ray beam in a cone-beam form from an x-ray source towards an object; detecting x-rays that pass through the object with an amorphous silicon flat-panel imager; generating an image of the object from the detected x-rays; and controlling the path of the radiation source based on the image. However, the prior art fails to teach or fairly suggest that the x-ray beam is generated by an x-ray source that moves independently of the amorphous silicon flat-panel imager, the x-ray source moves on a sinusoidal or sawtooth path constrained to a surface of a cylinder while the amorphous silicon flat-panel imager moves in a circular path on a surface of a cylinder, as claimed in claim 78.

With regard to claim 80, the prior art discloses a method of treating an object, comprising: moving a radiation source about a path; directing a beam of radiation from the radiation source towards an object; emitting an x-ray beam in a cone-beam form from an x-ray source towards an object; detecting x-rays that pass through the object with an amorphous silicon flat-panel imager; generating an image of the object from the detected x-rays; and controlling the path of the radiation source based on the image. However, the prior art fails to teach or fairly suggest that the x-ray beam is generated by an x-ray source that moves dependently of the amorphous silicon flat-panel imager, the x-ray source and the amorphous silicon flat-panel imager each moves on a sinusoidal trajectory on a spherical surface, as claimed in claim 80.

Response to Arguments

27. Applicant's arguments with respect to claims 1-23, 26-35, and 64-77 have been considered but are moot in view of the new ground(s) of rejection.

Applicants argue that the slice imaging disclosed by Swerdloff *et al.* is different from a cone-beam CT system. In response, the examiner has incorporated a new reference (Hu) in the rejection that provides a motivation for replacing slice imaging with a cone-beam CT system. As a result of this replacement, it would have been obvious to employ a two-dimensional flat panel imager in order to intercept a cone-beam. Applicants contend that such a replacement would render the therapy planning software disclosed by Swerdloff *et al.* ineffective. Although the therapy planning software was designed to operate on slice images, it is the examiner's position that a person skilled in the art would recognize this deficiency and change the software in accordance with this replacement.

Applicants further argue that Swerdloff *et al.* failed to teach that the control of the gantry is based on an image because Swerdloff *et al.* relied on a human operator to determine the areas where radiations are to be delivered. The examiner respectively disagrees. The language of the claim is such that it is totally irrelevant whether or not there is human intervention; claim 1 only claims that the computer sends signals based on the image to the radiation source that controls the path of the radiation source. Although a human operator provides inputs in addition to the received image, it does not change the fact that the signal sent by the computer to control the path of the radiation is still based on the image.

Conclusion

28. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Tachibana (U. S. Patent No. 6,269,143 B1) disclosed a radiotherapy planning system comprising a gantry with two arms.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (703) 308-6189. The examiner can normally be reached on Monday - Friday from 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached at (703) 308-4858. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0530.

Allen C. Ho

Allen C. Ho
Patent Examiner
Art Unit 2882

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